Normal pancreas and pancreatic cancer: comparison among different diffusion weighted MR imaging acquisitions at 3.0T

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Introduction

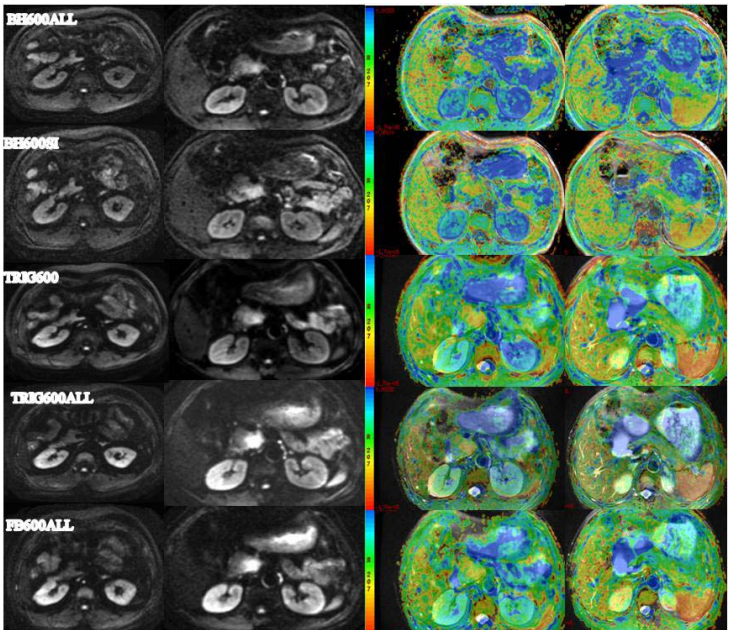
Diffusion weighted imaging(DWI) is a powerful tool to qualitatively and quantitatively evaluate pancreatic cancer. With the increasingly clinical application of 3.0T MR, techniques of DWI on pancreas were needed to be further clarified and understood, because of its greater energy deposition, magnetic susceptibility artifacts, more sensitivity of respiration, movement of blood vessels and gut around pancreas. The purpose of this study was to investigate 3.0T DWI technique with different parameters in artifacts, signal to noise ratio(SNR) and apparent diffusion coefficient(ADC) of normal pancreas and contrast(C), contrast to noise ratio(CNR) and ADC value of pancreatic cancer. Finally, to find a best solution of DWI on pancreas.

Materials and Methods

All different DWI sequences were performed on both 15 normal volunteers and 30 patients with pancreatic cancer proven by histopathology at 3T. Five DWI acquisitions were based on SE-EPI sequence with b values=0 and 600 s/mm2. DWI acquisitions included breath-holding DWI with MPG pulses in X、Y、Z direction(BH600ALL), breath-holding DWI with MPG pulse in Z direction(BH600SI), respiratory-triggered DWI with MPG pulses in X、Y、Z direction(TRIG600), respiratory-triggered DWI with MPG pulses in X、Y、Z direction and inversion recovery for fat saturation (TRIG600+BS), free-breathing DWI with MPG pulses in X、Y、Z direction and inversion recovery for fat saturation (FB600+BS). Artifacts, SNR and ADC value of normal pancreas and C, CNR and ADC value of pancreatic cancer were statistically investigated and compared among different DWI acquisitions.

Results and discussion

Statistical differences were significantly noticed in artifacts and SNR and ADC value of normal pancreas among different DWI sequences by ANOVA($p < 0.00001$). Normal pancreas displayed the lowest artifact in TRIG600+BS and the highest SNR in TRIG600. Whereas, statistical difference was not observed in ADC values of pancreatic cancer among different DWI sequences by Kruskal–Wallis test($p=0.095$). C of pancreatic cancer in TRIG600+BS was statistically higher than that in all other DWI acquisitions, while CNR of pancreatic cancer in TRIG600 and TRIG600+BS was statistically higher than that in other DWI acquisitions. Obviously different ADC values among pancreatic cancer, adjacent pancreatic tissue and distal pancreatitis was noticed by ANOVA in all TRIG600, TRIG600+BS and FB600+BS ($p=0.010$, $p=0.000002$ and $p=0.000006$ respectively).



DWI images in normal pancreas and pancreatic cancer and ADC color maps of pancreatic cancer and distal pancreatitis by five different acquisitions at 3.0T

Conclusion

Compared to other four DWI acquisitions, TRIG600+BS at 3.0T with higher C and CNR of pancreatic cancer helps to detect the lesion, and its ADC value can better disclose histopathological state in pancreatic cancer, adjacent pancreatic tissue and distal pancreatitis.

References

[1] Dale BM et al. Invest radiol 45:104(2010). [2] hikawa T et al. AJR Am J Roentgenol 188:409(2007).